

Plumilus grandicollis (Ménétriés, 1832) (Coleoptera: Anobiidae: Ptilininae): a new pest of ash wood (*Fraxinus angustifolia* Vahl, 1804) (Lamiales: Oleaceae) and locality report in Türkiye

Plumilus grandicollis (Ménétriés, 1832) (Coleoptera: Anobiidae: Ptilininae): yeni bir dişbudak odunu (*Fraxinus angustifolia* Vahl, 1804) (Lamiales: Oleaceae) zararlısı ve Türkiye için yeni bir lokalite kaydı

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Abstract

This study was carried out in the Suleymaniye floodplain forests within the area of Hendek Forestry Enterprises in Sakarya province between the years of 2020-2021. Nine pheromone traps and 12 trap woods were placed in two different areas. In addition, the region's monthly temperature and relative humidity were recorded by a data logger that was placed in the study area. The pheromone traps and trap woods were checked every 20 days period and the insects were collected and identified in the laboratory. In addition, overturned ash woods were broken in the field and insects were collected and identified. In addition, boles and branches of the overthrown ash trees that were in the study area were cut into pieces in the field and developing insects were collected and identified. In this study, *Plumilus grandicollis* (Ménétriés, 1832) (Coleoptera: Anobiidae: Ptilininae) was detected with locality in Türkiye and as a new pest species for ash (*Fraxinus angustifolia* Vahl, 1804) (Lamiales: Oleaceae) wood

Keywords: Suleymaniye floodplain forests, new record, insect, ash wood, pest

Öz

Bu çalışma 2020-2021 yılları arasında Sakarya ili Hendek Orman İşletme Müdürlüğü sınırları içerisindeki Süleymaniye Subasar Ormanında yapılmıştır. İki farklı alana 9 adet feromon ve 12 tuzak odunu yerleştirilmiştir. Ayrıca alana veri kaydedici (data logger) yerleştirilerek yörenin aylık sıcaklık ve bağıl nemi belirlenmiştir. Feromon ve ağaç tuzakları her 20 günde bir kontrol edilmiş ve böcekler toplanarak laboratuvarında teşhis edilmiştir. Ayrıca sahadaki devrik dişbudak ağaçları parçalanarak zarar yapan böcekler teşhis edilmiştir. Çalışmada *Plumilus grandicollis* (Ménétriés, 1832) (Coleoptera: Anobiidae: Ptilininae) hem Türkiye'de lokalite ile yeni bir kayıt hem de dişbudak (*Fraxinus angustifolia* Vahl, 1804) (Lamiales: Oleaceae) ağacı için yeni bir zararlı tür olarak ilk kez tespit edilmiştir.

Anahtar Sözcükler: Süleymaniye subasar ormanı, yeni kayıt, böcek, dişbudak odunu, zararlı



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1. Introduction

With the developing technology in recent years, transportation networks are expanding both between countries and within the country, and forest and forest products can be easily transported from one point to another. Insect species that are harmful in a certain region are also transported together with the transported products (Lowe et al., 2000). As a result, insects can reproduce by adapting to their environments. Insects which constitute the most crowded living group in the world are in balance with many factors in their natural ecosystems. However, due to changing environmental conditions and nutritional deficiencies, they reproduce in a short time in the environment they are transported and cause significant damage until they are noticed (Hızal et al., 2015).

Ptilininae insects are included in the superfamily Bostrichoidea and the family Anobiidae, including the Bostrichidae, and Lyctidae. Little is known about the biology of insects belonging to the subfamily Ptilininae family. However, beetles and larvae of insects of the family Anobiidae are generally associated with living or decaying tree species (Belles, 2009). The larvae of the subfamily Ptilininae insects reach a length of 6-10 mm before pupae, and the adults reach a length of 2-8 mm. The larvae open 1-4 mm galleries in the wood (Martin and Lopez, 2023). In addition to causing significant damage to products stored in warehouses, larvae can develop on branches, roots, trunks and cones of trees (Zahradnik and Háva, 2022). Insects belonging to the Anobiidae family, which is the closest to the subfamily Ptilininae, are an important family that causes economic losses in wood material (Kaygin et al., 2008).

The family Anobiidae is described and represented over 1000 species worldwide (Cabrera, 2011). Although insects belonging to this family are more common in hot and semi-arid regions, they are widespread in a large part of the world. It was reported that *P. grandicollis* spread without specifying locality in Armenia, Azerbaijan, Georgia, Germany (introduced), Iran, Israel, Romania, Russia, Turkmenistan and Turkey (Zahradnik, 2007).

In the present study, the adults of *P. grandicollis* were detected with locality in ash wood (*F. angustifolia*) in Süleymaniye Floodplain Forest, Hendek district of Sakarya province, Türkiye. In addition, the ash tree appeared for the first time among the hosts of the insect in this study.

2. Material and Methods

2.1. Study area

The study area consists of ash forest (*Fraxinus angustifolia* Vahl) (Süleymaniye floodplain forests) within the Pasakoy and Sukenarı quarters of Hendek district of Sakarya province, Türkiye. Coordinates of the study area are 40°48'-53'N, 30°34'38' E. The slope of the studied forest is 0-2%, it is 25 m asl, and at a horizontal distance of about 33 km from the Black Sea.

It has been reported that the annual average temperature of the study area is 14,2 °C and the annual total precipitation is 798 mm. When the climatic characteristics are examined, it is seen that the Marmara maritime climate and the Black Sea climate are in the transition zone. Groundwater in the area can rise to the soil surface between January and May. Tree taxa of the study area are *Ulmus laevis* Pall., *U. minor* Mill., *Acer campestre* L. and *Quercus robur* L., as well as ash (Carus and Çiçek, 2007). There is a total of 1371.1 hectares of ash forest at the location of the study area, and it consists entirely of floodplain forest. In the past years, the groundwater rose by 1,0-1,5 meters with spring rains between January and May, but as a result of the drainage arrangements made in recent years, the water rise does not occur as much as before (Çiçek, 2002). The protection of the habitat of this forest has great importance for the region since these forests are a rare natural value for both Turkey and Europe (Toker et al., 2021). The map of the study area is given in Figure 1.

Insect collection cages that were integrated into 9 Scandinavian-type pheromone traps were installed at 300 meters intervals in the area. Data loggers that record the region's temperature and relative humidity data were recorded during the study period. Alpha pinene, ipsdienol, ipsenol, 2 methyl 3 butanol and ethyl alcohol were used as pheromone attractants. Trap woods were also prepared from ash together with pheromone traps and placed on the field.

The site was visited and pheromone and trap woods were checked in 20-day periods in 2020 and 2021. Overthrown and holding wood (old wooden materials) (Figure 2) in the field were cut into pieces by a cutter and adult and larval insects were investigated. In addition, the trunk parts of the trees planted and weakened trees in the field were controlled and harmful insects were collected. The caught insects were placed in plastic boxes and brought to the Forest Protection and Entomology Laboratory, Forestry Faculty of Düzce University.

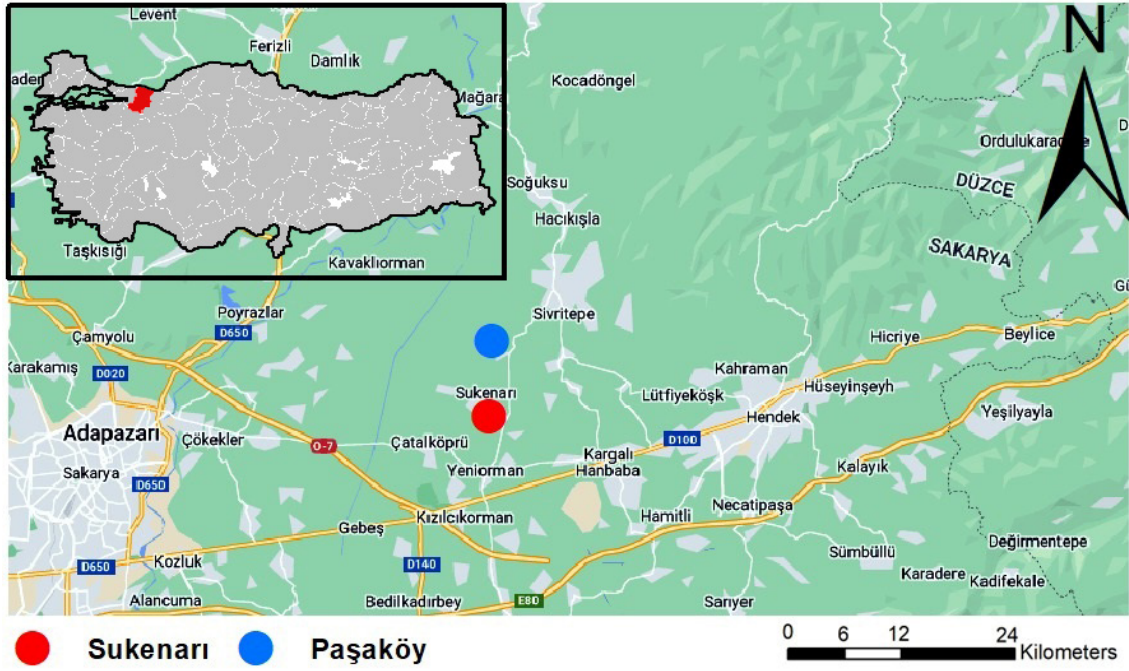


Figure 1. Map of the study area
Şekil 1. Çalışma alanı haritası

The male genitalia (aedeagus) were used for the species identification. To be able to identify insect species, genital organs were prepared. The insect sample was softened with hot water and ethanol

then the genitalia were extracted. Insects were identified using identification keys (Logvinovsky, 1985). Insect identifications were carried out under a stereo microscope.



Figure 2. a) Ash trees, b) exit holes of *Plumilus grandicollis* beetle (Photograph: Çağlar Akçay).
Şekil 2. Dişbudak ağaçları (a) ve *Plumilus grandicollis* böceğinin çıkış delikleri (b) (Fotoğraf: Çağlar Akçay).

3. Results and discussion

As a result of the investigations, male and female adults of *Plumilus grandicollis* (Ménétriés, 1832) (Coleoptera: Anobiidae: Ptilininae) were deter-

mined in overthrown ash woods, monumental ash trees and pheromone traps. According to Nikitsky et al. (2008), the *P. grandicollis* beetle has been detected in the literature on fig (*Ficus* sp. and beech (*Fagus* sp.) trees. However, in this study, it

was determined for the first time that it caused damage to ash woods. In a recently published study, Farashiani et al. (2022) detected saproxylic beetles (Coleoptera) in Hyrcanian forests (Iran). In addition, Zahradnik (1998) and Zahradnik (2007) stated that *P. grandicollis* spread in Armenia, Azerbaijan, Georgia, Germany (introduced), Iran, Israel, Romania, Russia and Turkmenistan. He states that it spreads in Türkiye without specifying the locality. In this study, *P. grandicollis* was detected in Türkiye by giving the exact locality (Süleymaniye Floodplain Forest, Paşaköy and Sukenarı quarters, Hendek district of Sakarya province, Türkiye). *Plu-*

milus grandicollis and *Ptilinus grandicollis* are synonyms of the insect (Zahradnik and Háva, 2014). Table 1 shows monthly average temperature and relative humidity data of the study area in 2021. When the average monthly temperature and relative humidity data at the Sukenarı and Paşaköy points where the insect found were examined, it was seen that the average temperature was 19 - 23 °C and the relative humidity was around 83% in June and July when the insect was detected. Temperature and relative humidity in the area reach highest point in summer and then decrease.

Table 1. Monthly average temperature and relative humidity data of the study area
Tablo 1. Çalışma alanının aylık ortalama sıcaklık ve bağıl nem verileri

Months	Sukenarı		Paşaköy	
	Temperature (°C)	Relative humidity (%)	Temperature (°C)	Relative humidity (%)
April	16.1	69.8	16	71.5
May	17.2	74.7	17.4	76.12
Jun	19.2	83.2	19.6	83.3
July	23.2	83	23.5	83.97
August	22.6	79.2	23.2	81.3
September	18.3	74.8	18.3	80.6
October	15.8	77.2	15.7	84.9

It was determined that the age of 15 ash trees, whose age was measured in the area where the study was carried out, ranged from 103 to 211 (Gürsu, 1971). Approximately 150 exit holes have been detected in an area of 1 m² in the trees which has insect damaged in the Sukenarı location on 26th of Jun, 2020. The diameters of the exit holes were measured between approximately 2 mm and 5 mm (Figure 2). Adults of the beetle were detected in pheromone traps in Paşaköy area on the 6th of July, 2020.

Lateral view, dorsal view, male and female of *P.*

grandicollis is given in Figure 3, Figure 4 and Figure 5). When the lengths of the adult insects were examined, it was seen that they were between 2.5-4 mm. The adults have a cylindrical body and their color is between dark reddish and dark brown. Antennas have 11 segments. In the dorsal view of the female beetles, as in the *Anobium punctatum* (De Geer, 1774) (Coleoptera: Anobiidae) beetle, the head is not visible since the pronotum covered head from above. Dotted structures are present on the pronotum and elytra (Figure 5)



Figure 3. *Plumilus grandicollis* lateral view (Photograph: Beşir Yüksel).
Şekil 3. *Plumilus grandicollis* lateral görünüş (Fotoğraf: Beşir Yüksel).



Figure 4. *Plumilus grandicollis* male (Photograph: Beşir Yüksel).
Şekil 4. *Plumilus grandicollis* erkek (Fotoğraf: Beşir Yüksel)

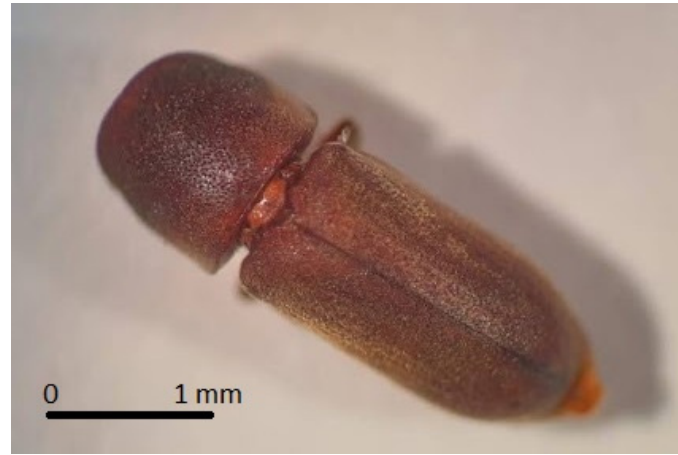


Figure 5. *Plumilus grandicollis* female (Dorsal view) (Photograph: Beşir Yüksel).
Şekil 5. *Plumilus grandicollis* dişi (Dorsal görünüş) (Fotoğraf: Beşir Yüksel)

Genital organ of the male individual, aedeagus, extracted in the current study and literature is given in Figure 6 and Figure 7. Paramere, phallobase,

basal strut in the images of the genital organ in the current study match the drawing by Logvinovsky (1985).

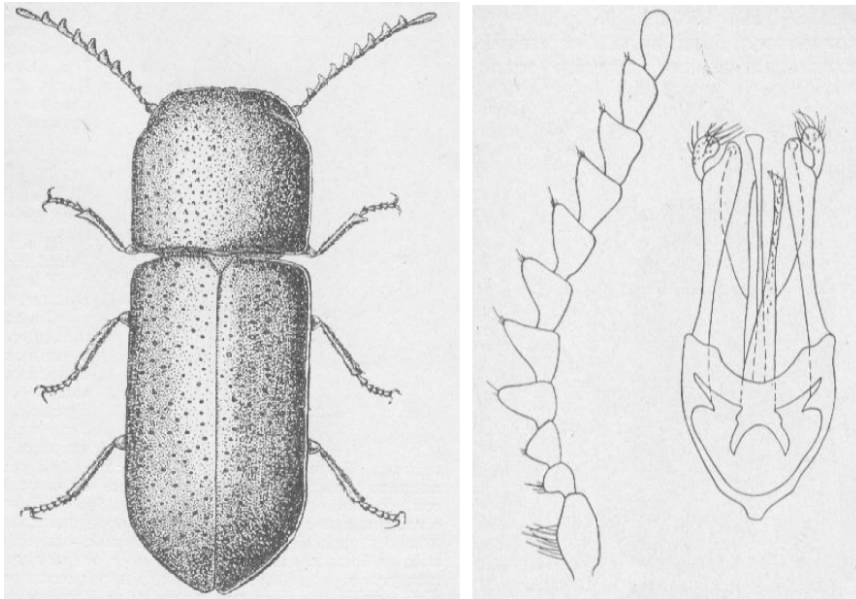


Figure 6. *Left: the adult, right: antennae and aedeagus of Plumilus grandicollis* (Logvinovsky, 1985).
Şekil 6. *Plumilus grandicollis*'e ait ergin, anten ve erkeklik üreme organı (Logvinovsky, 1985).

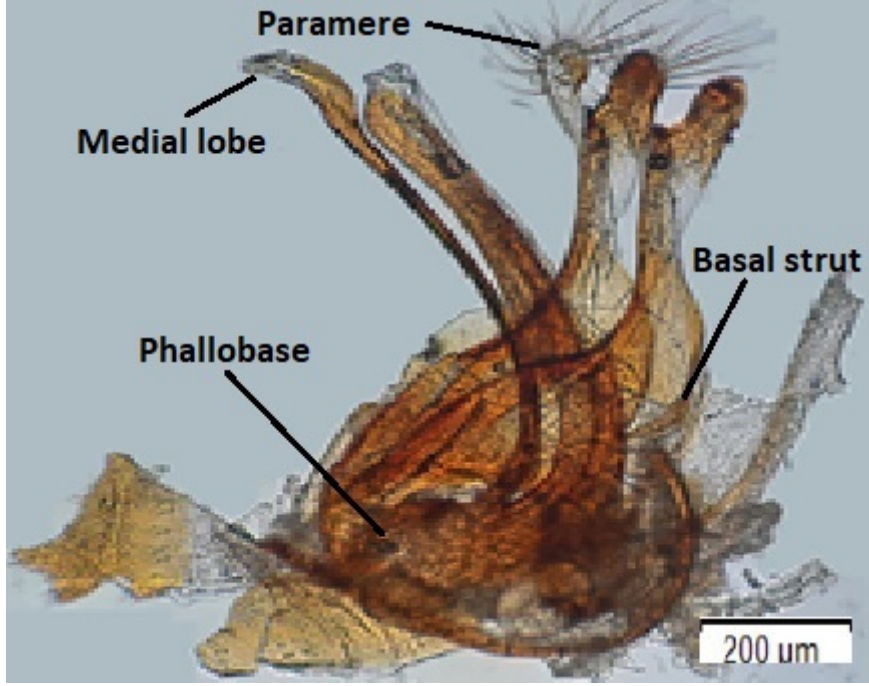


Figure 7. The aedeagus of *Plumilus grandicollis* detected in the current study (Photograph: Beşir Yüksel).
Şekil 7. Mevcut çalışmada tespit edilen *Plumilus grandicollis*'e ait erkeklik üreme organı (Fotoğraf: Beşir Yüksel).

4. Conclusion

In conclusion, this study was carried out in the Süleymaniye Floodplain Forest of Hendek district, Sakarya province between the years of 2020-2021. According to the current study, *P. grandicollis* was reported with locality in Türkiye and new pest for the ash wood (*Fraxinus angustifolia* Vahl.).

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References

- Bellés, X. 2009. Spider beetles (Coleoptera, Ptinidae) from the Socotra archipelago. *Fauna of Arabia* 24: 145-154.
- Carus, S., Çiçek, E., 2007. Adapazarı-Süleymaniye dış-budak plantasyonlarında (*Fraxinus angustifolia* Vahl.) tek ağaçlar için bir çap artım modeli. *Turkish Journal of Forestry* 8(1): 34-48. doi:10.18182/tjf.10108
- Çiçek, E., 2002. Adapazarı-Süleymaniye Subasar Ormanında Meşcere Kuruluşları ve Gerekli Silvikültürel Önlemler. İstanbul Üniversitesi. Fen Bilimleri Enstitüsü. Doktora Tezi. İstanbul.
- Farashiani, M. E., Varandi, H. B., Kazerani, F., Yarmand, H., Babae, M., Thorn, S., Amini, S., 2022. A preliminary checklist of saproxylic beetles (Coleoptera) in the

Hyrcanian forests of Iran, with distributional data. *Check List* 18(5): 1053-1120. doi. org/10.15560/18.5.1063

Gürsu, I. 1971. Süleymaniye Ormanı Sivri Meyveli Dış-budakları (*Fraxinus oxycarpa* Willd.) Odununun Bazı Fiziksel ve Mekanik Özellikleri ve Değerlendirme İmkânları Hakkında Araştırmalar. Ormancılık Araştırma Enstitüsü, Teknik Bülten No: 47, Ankara.

Cabrera, B. J., 2001. *Cigarette Beetle, Lasioderma serricorne* (F.) (Insecta: Coleoptera: Anobiidae). University of Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, EDIS.

Hızal, E., Arslangündoğdu, Z., Göç, A., Ak, M., 2015. The new record for Turkish invasive alien insect fauna *Anoplophora chinensis* (Forster, 1771) (Coleoptera: Cerambycidae). *Journal of the Faculty of Forestry Istanbul University* 65: 7-10 DOI: 10.17099/jffiu.48469

Kaygin, A.T., Yıldız, Y., Umit, Ç., Yıldız, Y., Onat, S.M., Ozkazanc, N.K., Kaygin, B., Celikyay, S., 2008. An Important Wood Destroying Beetle: *Anobium punctatum* (De Geer) (Coleoptera: Anobiidae) and Distribution of Western Black Sea region. 39th International Research Group in Wood Preservation Annual Meeting, Istanbul, May 2008.

Logvinovsky V. D, 1985. Фауна СССР. Насекомые жесткокрылые. Точильщики-семейство Anobiidae: монография. (Fauna of the USSR. Coleoptera Insects. Grinders-family Anobiidae: monograph). Editör: Scarlato O.A. Leningrad: Nauka, 1985. Cilt: XIV, sayı 2. 177 sayfa. https://www.zin.ru/animalia/coleoptera/pdf/fauna_ssr_anobiidae_opt.pdf. (access date: December 2022). In Russia.

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- Lowe, S., Browne, M., Boudjelas, S., Poorter, M. De, 2000. De Poorter, M. 2000. 100 of the World's Worst Invasive Alien Species A selection from the Global Invasive Species Database. By ISSG of IUCN. Auckland, New Zealand.
- Martin, J. A, Lopez, R., 2023. Biological Deterioration and Natural Durability of Wood in Europe. *Forests* 14(2): 283. <https://doi.org/10.3390/f14020283>
- Nikitsky, N. B., Bibin, A. R., Dolgin, M. M., 2008. *Xylophilous beetles* (Coleoptera) of the Caucasian State Natural Biosphere Reserve and adjacent territories. *Syktivkar*: 452 pp. [in Russian]. Institute of Biology, Komi Scientific Center, Ural Branch of the Russian Academy of Sciences. UDC 595 76 (1-924.72/76)
- Toker, M., Çolak, E., Sunar, F., 2021. Spatiotemporal Change Analysis of the Protected Areas: A Case Study–İğneada Floodplain Forests. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences* 43: 735-740.
- Zahradník, P., 2007. Ptinidae (excluding Gibbiinae and Ptininae). In: Catalogue of Palaearctic Coleoptera. Vol. 4. Elateroidea- Derodontoidea- Bostrichoidea- Lymexyloidea- Cleroidea- Cucujoidea. Löbl, I., Smetana, A. (Eds.). Stenstrup: Apollo Books, Denmark, p. 339-362
- Zahradník, P., Háva, J., 2014. Catalogue of the world genera and subgenera of the superfamilies Derodontoidea and Bostrichoidea (Coleoptera: Derodontiformia, Bostrichiformia). *Zootaxa* 3754 (4): 301–352. doi.org/10.11646/zootaxa.3754.4.1
- Zahradnik, P., 1998. Anobiidae of Turkey (Coleoptera). *Klapalekiana* 34: 263-286, ISSN 1210-6100